Statement of
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Subcommittee on Public Lands and Forests
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Committee on Energy and Natural Resources
United States Senate

Late-Successional and Old-Growth Forests in the Pacific Northwest

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Mr Chairman, Senators, thank you for the opportunity to testify regarding pending legislation to protect old-growth forests in Oregon and Washington

My name is David A. Perry

I am a Professor (emeritus) in the Department of Forest Science, Oregon State University.

I am a member of the National Commission on the Science of Sustainable Forestry, and serve on the Board of Directors of the National Center for Conservation Science and Policy. I am a former member of the Marbled Murrelet Recovery Team, The Scientific Societies Panel on Interim Protection for Old Growth Forests in eastern Oregon and Washington, and the National Research Council's Panel on Environmental Issues in Pacific Northwest Forests.

I'll begin by quoting a central recommendation of the National Research Council's Committee on Environmental Issues in Pacific Northwest Forest Management (NRC 2000):

Forest Management in the Pacific Northwest should include the conservation and protection of most or all of the remaining late-successional and old-growth forests.... The remaining late-successional and old-growth forests could form the cores of regional forests managed for truly and indefinitely sustainable production of timber, fish, clean water, recreation, and numerous other amenities of forested ecosystems.

Note the terminology used here differs somewhat from other uses. By "late-successional", the NRC panel refers to what is also called "mature", the seral stage immediately preceding old-growth.

In the following I'll first discuss the common definitions for old-growth and its current status as compared to historic. I'll then briefly go into the ecological rationale for protecting what remains. I'll close by discussing mature forests and the rationale for protecting them as well as old-growth.

I. Defining Old-Growth

Both old-growth (OG) and mature are best defined by their structure (which may vary with forest type). From an ecological standpoint, the most accurate definition for OG is that given by the National Research Council Panel of Environmental Issues in Pacific Northwest Forests (NRC 2000)

> Old-growth forests are forests that have accumulated specific characteristics related to tree size, canopy structure, snags and woody debris and plant associations. Ecological characteristics of old-growth forests emerge through the processes of succession. Certain features - presence of large, old trees, multilayered canopies, forest gaps, snags, woody debris, and a particular set of species that occur primarily in old-growth forests - do not appear simultaneously, nor at a fixed time in stand development. Specific attributes of old-growth forests develop through forest succession until the collective properties of an older forest are evident

It is generally accepted that forests develop the full set of OG characteristics by 180 to 220 years, although as the NRC definition indicates there is no sharp dividing line and forests begin displaying some OG characteristics at a younger age. Note also that not all of the characteristics cited in the above quote hold in all forest types. In particular, multi-layered canopies are not a characteristic of old-growth pine on dry sites.

II. The current extent of old-growth forests in Oregon and Washington is only a small fraction of the original.

The amount of OG at the time of European settlement varied by region, but for the two states together is estimated to have composed nearly two-thirds of the total land area of western Oregon, western Washington and the east slopes of the Cascades (Strittholt et al 2006). Historic proportions in the Blue Mountains, Klamath Plateau, and Colville area were similar; a USFS inventory of the latter three areas in the mid-1930's classed 65 per cent of forests as either as OG or, in types where OG wasn't distinguished, as "large". This was after a 20 year period of heavy

logging, so it is reasonable to assume that the pre-logging area of OG forest in the eastern portions of the two states was even greater than in the western portions.

Strittholt et al (2006) used remote imagery to document current OG amounts in western Oregon, western Washington, and the east slopes of the Cascades (forests within the range of the northern spotted owl (NSO). At the turn of the 21st century approximately 28 per cent of the original OG remained, largely concentrated on public lands (Strittholt et al. 2006). One-third of the OG remaining on public lands, representing approximately 7 per cent of the original, is in relatively secure protected status (e.g. Wilderness, National Parks). OG contained within Late Successional Reserves and Designated Roadless Areas is less securely protected (e.g. the recent attempt by the USFWS to include a no-LSR option in the draft NSO Recovery Plan), but including these areas increases the proportion of original OG within the range of the NSO that is presently in protected status to approximately 14 per cent.

In eastern Oregon and Washington outside the range of the NSO, Henjum et al. (1994) estimated that one-quarter of the original OG remained on National Forest Lands in the mid-1990's, 22 percent of which was protected in Wilderness or administratively withdrawn areas. Less than one-half of the areas designated as "dedicated old-growth" contained more than 70 percent OG, and nearly one-third contained none (Henjum et al. 1994). Logging all unprotected OG in the eastern regions of the two states would reduce that remaining to approximately 5 percent of the original.

III. Values of OG: Habitat

There is little question that "(m)uch of the biological diversity of the Pacific Northwest is associated with (mature) and old-growth forests" (NRC 2000).

From the standpoint of conservation ecology there are at least six reasons for protecting all remaining OG:

- The science is clear: when habitats have been sharply reduced the probability of maintaining viable populations of organisms that depend on those habitats increases directly with the amount of remaining habitat protected. Moreover, the increasing recognition of thresholds in species viability implies the relationship is nonlinear: relatively small changes in protection can translate to large effects on viability (Kareiva and Wennergren 1995). The amount of OG currently protected in Oregon

and Washington is far below the minimum amounts of habitat that conservation biologists believe is necessary to maintain species viability (Noss and Cooperrider 1994). Protecting all remaining OG would raise levels into the low range of that considered adequate.[1] Moreover, saving all would provide an important buffer against future losses. Natural disturbances are likely to destroy some of the remaining OG and mature habitat before younger forests have aged sufficiently to provide suitable replacement habitat, a risk significantly increased by the combined effects of changing climate and the increased vulnerability of older forests when embedded within a matrix of fire-prone young forests. On the east slopes of the Cascades, NSO habitat was lost at an average rate of 14.5%/year between 1994 and 2003 (Spies et al. 2006), and approximately 80,000 acres of NSO habitat was lost in the Biscuit fire. The more saved now, the greater the buffering against such losses

- Many species that occupy stable habitats—of which old forests are a prime example—have poor dispersal capabilities, hence risk isolation, genetic deterioration, and ultimate extinction when suitable habitat is spread too widely (Kareiva and Wennergren 1995). Studies suggest that many OG associates in the PNW may be limited more by dispersal than by the abundance of habitat per se, including species of lichens, bryophytes, mollusks, fungi, and invertebrates. This implies that every remaining piece of suitable habitat becomes an important focus for eventual colonization of the surrounding landscape. Potential problems with dispersal are exacerbated in the Pacific Northwest because young forests presently dominating the matrix do not have the structural complexity and legacies characteristic of naturally disturbed forests (e.g. Tappeiner et al 1997), resulting in a much starker contrast between old and young forests than occurred historically.
- Species, species assemblages, and the genetic structure of populations may vary at relatively fine scales for small organisms (which account for by far the largest share of diversity), raising the possibility that each remaining older forest is to some degree unique in its biological structure. For instance, many mollusk species are restricted to one region, or even one river drainage (Frest and Johannes 1993).

[1] "Adequate" may vary widely depending on specific circumstances and must be determined on a case-by-case basis. For example, the amount of area needed in strictly protected status depends

- Even small fragments of older forest may be significant biological reservoirs. Amaranthus et al. (1994) found that 3.5- ha fragments of mature forest harbored 13 species of truffle-forming mycorrhizal fungi not found in surrounding plantations.

IV. Other Values of OG

OG forests store large amounts of carbon that may take to several hundred years to recoup following logging. Some OG stands, especially those with infrequent fire regimes, accumulate large stores of carbon in the soil compared with mid-aged forests. .

OG has a strong influence on stream flows relative to younger stands. In an experiment comparing logged and unlogged basins in the Cascades, logged basins have had elevated stream flows for 40 years compared to their OG controls (Jones and Post 2004). Stream flows during the snowmelt season have been particularly slow in recovering to OG conditions. Another experiment that compared logged with 100 year-old forest rather than OG has shown a similar pattern.

Considerable evidence over the past two decades shows that OG is more resistant to crown fire than younger forests, and hence helps buffer the landscape against the possibility of mega-fires. Modeling shows that western Oregon is likely to become drier with climate warming, which means more fire and therefore an increased value of relatively resistant components on the landscape.

The situation with fire is complicated in the dry forest types, where various factors have allowed understory fire ladders to develop in OG forests, increasing their susceptibility to crown fires. Appropriate levels of fuels reduction are badly needed in many these dry forests, however at least three strict guidelines should be followed. First, large, fire resistant trees should be retained. Second, habitats for closed forest species should be protected, which means taking a landscape approach to thinning. Third, all caution should be taken to protect soils and streams.

V. Mature Forests

As recognized by FEMAT, a conservation strategy for the Pacific Northwest must consider mature forests as well as OG. Forests are considered to enter maturity when their mean annual increment culminates, following which time they begin developing the characteristics that

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on what is done in the matrix.

ultimately produce OG. Mature forests serve various important ecologic functions. They serve as future replacements for old-growth, help protect existing OG by reducing the starkness of age-class boundaries, and provide landscape connectivity and transitional habitat that compensate to some degree for the low levels of OG. Moreover, they are almost certainly more resistant to crown fires than younger forests, and hence contribute to buffering the landscape.

According to FEMAT, mature and old-growth forests together compose approximately 51% of federal forest lands within the range of the NSO in Oregon and Washington. Protecting all of these would have clear benefits from the standpoint of conservation and landscape ecology. A majority of the landscape dominated by large trees within forests that have or are developing complex structure provides habitat connectivity for late-successional species and lowers the risk of mega- wildfires. Complete hands-off is not necessary, and in the case of dry forests, management will be required to reduce fire hazard. In mesic forests there is unlikely to be any ecological justification for thinning in OG and older mature forests, however thinning may be both appropriate and beneficial in some younger mature stands. Such evaluations must be made on a case-by-case basis and involve both silvicultural and habitat considerations.

In summary, OG forests are centers of biological diversity, perform unique functions with regard to carbon storage and hydrologic regulation, and serve as relatively stable components of the landscape. Mature forests share many of the OG values. The area of OG has been sharply reduced compared to historic conditions, and amounts currently protected are well below scientifically accepted minimum habitat levels required to maintain species viability. Saving all remaining OG forests greatly enhances the probability of late-successional-dependent species persisting through this period of extreme habitat bottleneck, reduces the chance of flooding, and lowers the risk of mega-fires. Saving mature forests that are on a trajectory toward OG contributes significantly to these goals in the short run, and will be essential in the long run.

Sincerely,

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